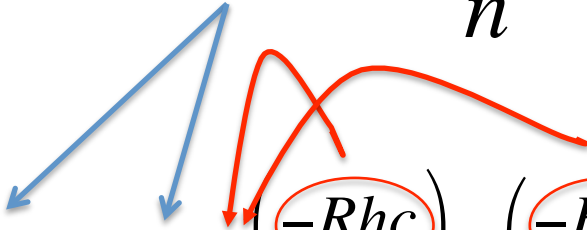


Energy levels of the (one electron) hydrogen atom

$$E = \frac{-Rhc}{n^2}$$


$$\Delta E = E_f - E_i = \left(\frac{-Rhc}{n_f^2} \right) - \left(\frac{-Rhc}{n_i^2} \right) = -Rhc \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

$$\Delta E = h\nu = \frac{\cancel{hc}}{\lambda} = -\cancel{Rhc} \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

$$\frac{1}{\lambda} = -R \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

Energy levels of the (one electron) hydrogen atom

$$\frac{1}{\lambda} = -R \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

Calculate wavelength (in nm) of the n=4 to n=2 transition of the hydrogen atom

$$\lambda = \frac{1}{-R \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)} = \frac{1}{-(1.097 \times 10^7 \text{ m}^{-1}) \left(\frac{1}{2^2} - \frac{1}{4^2} \right)} = 4.86 \times 10^{-7} \text{ m}$$

$$\lambda = 4.86 \times 10^{-7} \text{ m} \left(\frac{10^9 \text{ nm}}{\text{m}} \right) = 486 \text{ nm}$$

Wavelength of a 110 MPH baseball

$$\lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34} \text{ J} \cdot \text{s}}{(114 \text{ g})(110 \text{ miles} \cdot \text{hr}^{-1})} \frac{\text{kg} \cdot \text{m}^2}{\text{J} \cdot \text{s}^2} \frac{\text{mile}}{1609 \text{ m}} \frac{60 \text{ min}}{\text{hr}} \frac{60 \text{ s}}{\text{min}} \frac{10^3 \text{ g}}{\text{kg}}$$

$$J = \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2}$$

$$1 = \frac{\text{kg} \cdot \text{m}^2}{\text{J} \cdot \text{s}^2}$$

$$1 \text{ mile} = 1609 \text{ m}$$

$$1 = \frac{\text{mile}}{1609 \text{ m}}$$

$$1 \text{ hr} = 60 \text{ min}$$

$$1 = \frac{60 \text{ min}}{\text{hr}}$$

$$1 \text{ min} = 60 \text{ sec}$$

$$1 = \frac{60 \text{ sec}}{\text{min}}$$

$$\text{kg} = 10^3 \text{ g}$$

$$1 = \frac{10^3 \text{ g}}{\text{kg}}$$

$$\lambda = 1.2 \times 10^{-34} \text{ m}$$